

REMARKS

I. Introduction

In response to the Office Action dated September 22, 2004, Applicants have amended claims 2, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19 and 20 so as to further clarify the claimed subject matter. Support for these amendments can be found, for example, in Fig. 1 and its corresponding section of the specification. No new matter has been added.

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art references.

II. The Rejection Of The Claims Under 35 U.S.C. § 102

Claims 1, 4, 7, 10, 13, 16 and 19 are rejected under 35 U.S.C. § 102(b) as being anticipated by USP No. 5,654,840 to Patton. Applicants respectfully traverse this rejection for at least the following reasons.

Claim 1

Claim 1 recites in-part a disk storage apparatus comprising a disturbance estimation section for estimating the magnitude of a disturbance exerted on the head from the voltage signal by the voltage detection section and a drive signal from the drive section, and producing disturbance estimation information, and a disturbance monitor section for monitoring the disturbance estimation information by the disturbance estimation section, and prohibiting a record by the head if the disturbance estimation information exceeds an allowable range.

In accordance with one exemplary embodiment of the present invention, the disturbance estimation section 12 estimates a disturbance torque exerted on the arm 3 from the voltage signal

“Va” output by the voltage detection section and from a drive signal “u” as an input of the drive section 10, and outputs a disturbance estimation signal τd_{est} , where the correction section 15 receives the disturbance estimation signal τd_{est} from the disturbance estimation section 12 and the position control signal “c” from the position control section 14, and computes the position control signal “c” by the disturbance estimation signal τd_{est} , and outputs the drive signal “u” to the drive section 10. Also, the disturbance monitor section 18 outputs a switching signal “t1” to a record prohibit switch 17 when the magnitude of the disturbance estimation signal τd_{est} exceeds a predetermined value of allowable range, and turns off the switch 17 (see, e.g., page 23, lines 22-27 and page 24, lines 6-25 of the specification). As a result, the present invention advantageously provides a disk storage apparatus capable of position-controlling the head at a high accuracy with respect to a target track by compensating the disturbance (e.g., bearing friction, elastic force of FPC, or inertia force due to shock/vibration) without the need of an acceleration sensor (see, e.g., page 2, lines 27-33 of the specification).

Turning to the cited prior art, it is asserted in the Office Action that Patton discloses, at col. 6, lines 55-67, col. 7, lines 27-39 and lines 50-60 and col. 8, lines 56-65, the claimed disturbance estimation section. The Examiner also asserts that Patton discloses “calculating the position error signal, signifying the amount the head is off-track, and moving the head accordingly (see, page 3 of Office Action).”

However, contrary to the conclusion set forth in the pending rejection, Patton is silent to estimating the magnitude of the disturbance by utilizing a voltage signal and a drive signal from the VCM driving circuit means 24. Indeed, it would appear that Patton merely discloses utilizing a VCM voice coil winding 20 and VCM driver circuit means 24 connected to the VCM voice coil winding 20 so as to apply an electrical current (i.e., not a voltage signal and a drive signal) to the

VCM voice coil winding 20 through a sense resistor R_s , where the VCM amplifier 27 then extracts the voltage developed differentially across the VCM voice coil winding 20 to produce an output that represents the resistive component (IR), the inductance component ($L \cdot di/dt$) of the actuator movement, and the BEMF component of the rotational shock induced movement (see, col. 7, lines 27-33, lines 40-43 and 52-58). Also, the Examiner has not identified which elements of Patton correspond to the claimed voltage signal and drive signal.

In contrast, the present invention employs **a voltage signal** “ V_a ” obtained as a detection result generated in driving the actuator 7 and **a drive signal** “ u ” derived in the drive section 10 of the actuator, where the disturbance estimation information $\tau_{d_{est}}$ is produced based on the **voltage signal** detected by the voltage detection section 11 and the **drive signal** generated in the drive section, such that the disturbance estimation information produced represents an estimation of the magnitude of the disturbance exerted on the head (see, e.g., page 4, lines 2-21 of the specification).

Thus, at a minimum, Patton does not disclose or suggest a disk storage apparatus comprising a disturbance estimation section for estimating the magnitude of a disturbance exerted on said head from the voltage signal by said voltage detection section and a drive signal from said drive section, and producing disturbance estimation information, as recited by claim 1.

Furthermore, Patton discloses, at col. 10, lines 2-10, that if the magnitude of the residual **BEMF signal** (i.e., voltage generated in the coil through a magnetic field) exceeds the threshold level, a rotational shock event is deemed to have occurred, and the conventional disk drive controller aborts any write operation in progress (see, col. 6, lines 55-67).

However, Patton appears silent with regard to aborting any write operation if the electrical current (alleged disturbance estimation information) supplied to the VCM voice coil winding 20

through a sense resistor R_s or the differential voltage extracted by the VCM amplifier 27 exceeds **any allowable range**.

Thus, Patton also fails to disclose or suggest prohibiting a record by the head if the **disturbance estimation information exceeds an allowable range**, as recited by claim 1.

Accordingly, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), and at a minimum, Patton fails to disclose or suggest the foregoing claim elements, it is clear that Patton does not anticipate claim 1 or any of the claims dependent thereon.

Claim 4

Claim 4 recites in-part a disk storage apparatus comprising a disturbance estimation section for estimating the magnitude of a disturbance exerted on the head from **the voltage signal** by the voltage detection section and **the position control information** by the position control section, and producing disturbance estimation information, and a disturbance monitor section for monitoring the disturbance estimation information by the disturbance estimation section, and prohibiting a record by the head if the disturbance estimation information exceeds an allowable range.

However, contrary to the conclusion set forth in the pending rejection, Patton is silent with regard to estimating the magnitude of the disturbance by utilizing **a voltage signal and any position control information** from the VCM driving circuit means 24. Indeed, it would appear that Patton merely discloses utilizing a VCM voice coil winding 20 and VCM driver circuit means 24 connected to the VCM voice coil winding 20 so as to apply **an electrical current** (i.e., not a voltage signal and position control information) to the VCM voice coil winding 20 through a sense resistor

Rs, where the VCM amplifier 27 then extracts the voltage developed differentially across the VCM voice coil winding 20 to produce an output that represents the resistive component (IR), inductance component ($L \cdot di/dt$) of the actuator movement, and the BEMF component of the rotational shock induced movement (see, col. 7, lines 27-33, lines 40-43 and 52-58). Also, the Examiner has not identified which elements of Patton correspond to the claimed voltage signal and position control information.

Furthermore, for at least the reasons discussed above, Patton appears silent with regard to aborting any write operation if the electrical current (alleged disturbance estimation information) supplied to the VCM voice coil winding 20 through a sense resistor Rs or the differential voltage extracted by the VCM amplifier 27 exceeds any allowable range. Thus, at a minimum, Patton also fails to disclose or suggest the claim elements recited by claim 4.

Accordingly, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), and at a minimum, Patton fails to disclose or suggest the foregoing claim elements, it is clear that Patton does not anticipate claim 4 or any of the claims dependent thereon.

Claims 7, 10 and 16

Claims 7, 10 and 16 recite in-part a disk storage apparatus comprising 1) a velocity/disturbance estimation section for **producing velocity estimation information** and disturbance estimation information, 2) a position control section for **adding** the velocity estimation information to the **position error information**, and 3) a disturbance monitor section for **making**

valid the velocity estimation information with respect to the position error information in the position control section.

In the pending Office Action, the Examiner asserts that Patton discloses, at col. 6, lines 39-54, lines 10-39, and col. 9, line 63 to col. 10, line 9, the foregoing claim elements, respectively (see, pages 4 and 5 of the Office Action).

However, contrary to the conclusion set forth by the Examiner, at the cited portion, Patton merely discloses obtaining the corruption track data (i.e., not obtaining or producing any velocity information) if the head moves at a velocity greater than 0.15 inches per second. Indeed, it does not appear that Patton discusses or even recognizes **producing** any velocity estimation information, or **adding** the velocity estimation information to any position error information detected by the disk drive servo control circuitry (see, col. 6, lines 14-18), let alone making valid of the **velocity estimation information** with respect to the position error information. Also, the Examiner has not identified which elements of Patton correspond to the claimed velocity estimation information and position error information, nor addressed how the **velocity estimation information** is made valid when the electrical current (alleged **disturbance estimation information**) exceeds an allowable range. Thus, at a minimum, Patton also fails to disclose or suggest the claim elements recited by claims 7, 10 and 16.

Accordingly, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), and at a minimum, Patton fails to disclose or suggest the foregoing claim elements, it is clear that Patton does not anticipate claim 7, 10 or 16, or any of the claims dependent thereon.

Claims 13 and 19

Claims 13 and 19 recite in-part a disk storage apparatus comprising a velocity/disturbance estimation section for estimating a head moving velocity and the magnitude of a disturbance exerted on said head from the voltage signal by said voltage detection section and from position control information by a position control section, and producing velocity estimation information and disturbance estimation information.

However, contrary to the conclusion set forth in the pending rejection, Patton is silent with regard to estimating a head moving velocity and the magnitude of a disturbance by utilizing a voltage signal and any position control information from the VCM driving circuit means 24. Indeed, it would appear that Patton merely discloses utilizing a VCM voice coil winding 20 and VCM driver circuit means 24 connected to the VCM voice coil winding 20 so as to apply an electrical current (i.e., not a voltage signal and position control information) to the VCM voice coil winding 20 through a sense resistor R_s , where the VCM amplifier 27 then extracts the voltage developed differentially across the VCM voice coil winding 20 to produce an output that represents the resistive component (IR), inductance component ($L \cdot di/dt$) of the actuator movement, and the BEMF component of the rotational shock induced movement (see, col. 7, lines 27-33, lines 40-43 and 52-58). Also, the Examiner has not identified which elements of Patton correspond to the claimed head moving velocity, voltage signal and position error information. Thus, at a minimum, Patton also does not disclose or suggest the claim elements recited by claims 13 and 19.

Accordingly, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), and at

a minimum, Patton fails to disclose or suggest the foregoing claim elements, it is clear that Patton does not anticipate claim 13 or 19, or any of the claims dependent thereon.

III. All Dependent Claims Are Allowable Because The Independent Claims From Which They Depend Are Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as independent claims 1, 7, 10, 13, 16 and 19 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also in condition for allowance.

For all of the foregoing reasons, it is submitted that dependent claims 3, 6, 9, 12, 15, 18 and 21 are patentable over the cited prior art. Accordingly, it is respectfully submitted that the rejections of claims 1, 7, 10, 13, 16 and 19 under 35 U.S.C. § 102 and claims 3, 6, 9, 12, 15, 18 and 21 under 35 U.S.C. § 103 have been overcome.

IV. Conclusion

Accordingly, it is urged that the application is in condition for allowance, an indication of which is respectfully solicited.

If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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